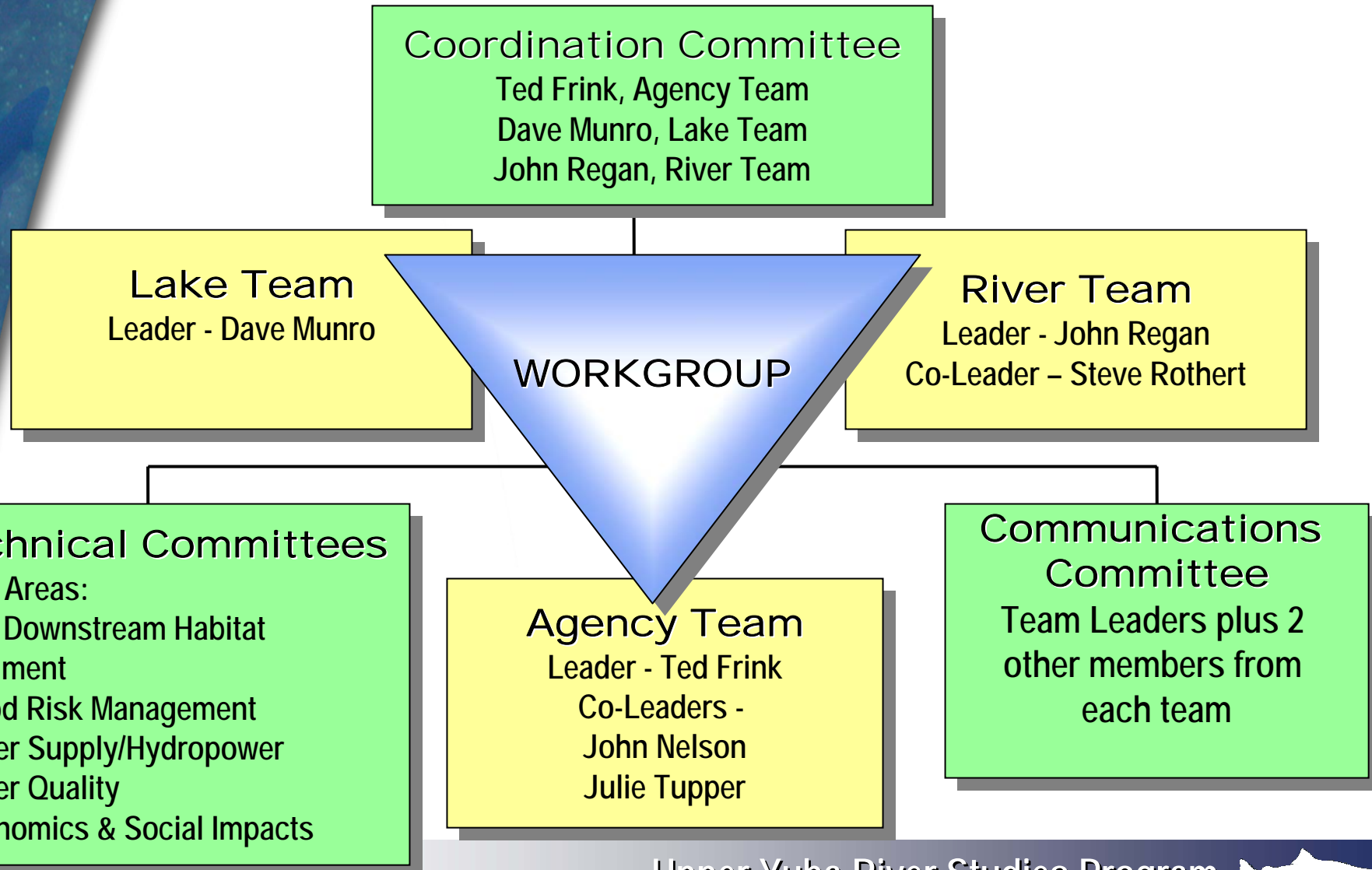


The background of the slide is a deep blue, textured image showing several salmon swimming underwater. The fish are depicted in various positions, some facing left and some right, creating a sense of movement. The lighting is soft, highlighting the silvery scales of the fish against the darker blue water.

# Upper Yuba River Studies Program Progress Update

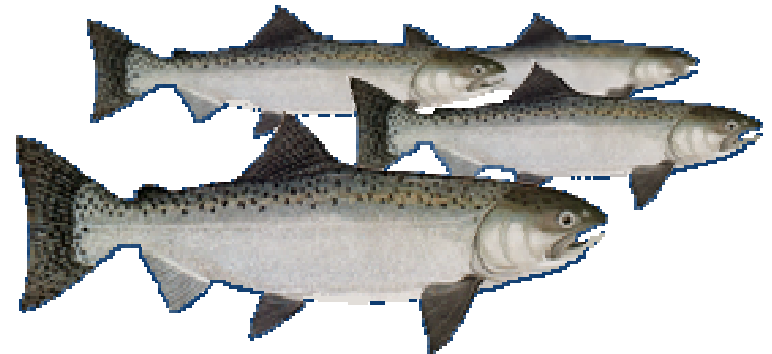
*January 19, 2005*

# A collaborative, stakeholder-driven process



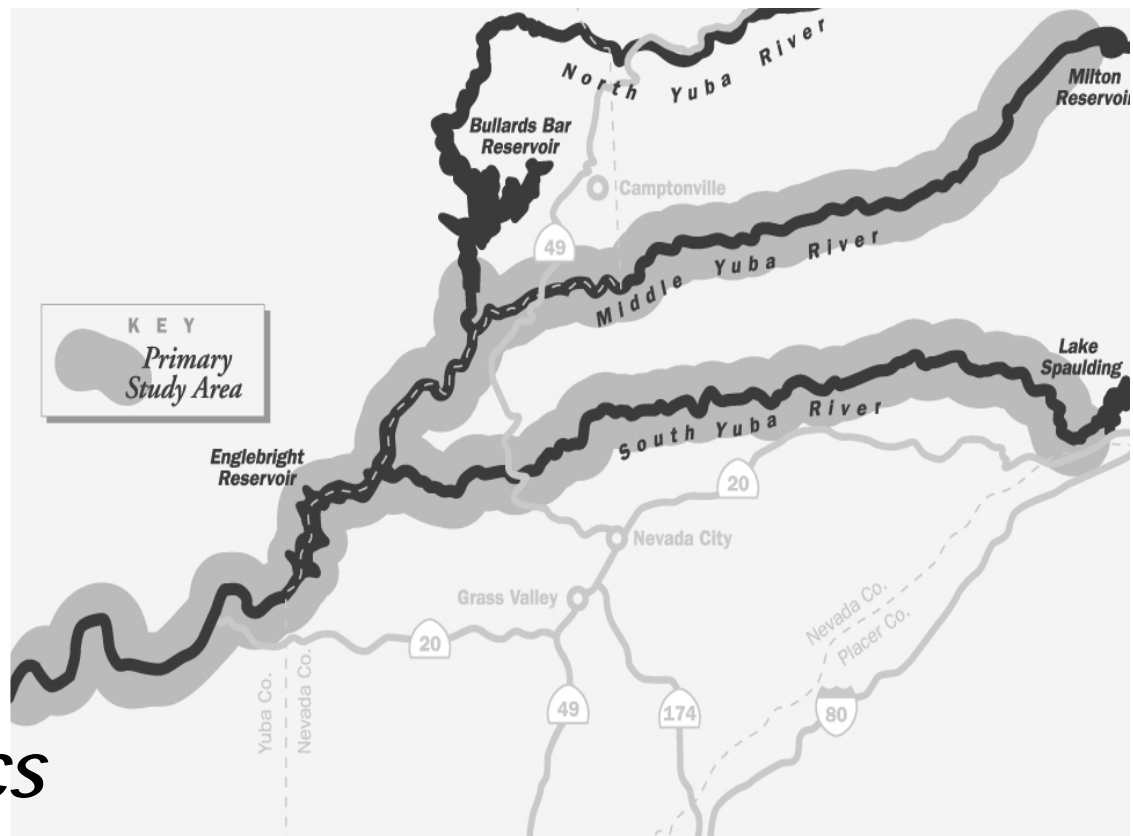
# Purpose Statement

“To determine if the introduction of wild chinook salmon and steelhead to the Upper Yuba River watershed is biologically, environmentally, and socio-economically feasible over the long term.”



# Study Elements

- ❖ *Habitat*
- ❖ *Sediment*
- ❖ *Water Quality*
- ❖ *Water Supply & Hydropower*
- ❖ *Flood Risk*
- ❖ *Socio-Economics*





# Upper River Habitat Studies

❖ *How much habitat?*

❖ *Study Components*

- *Fish Passage Barriers*
- *Holding Pools*
- *Spawning Habitat*
- *Rearing Habitat*

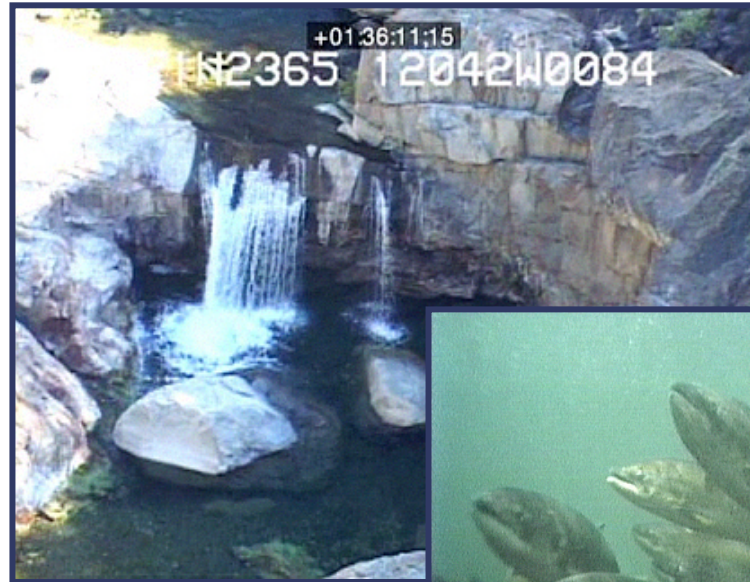
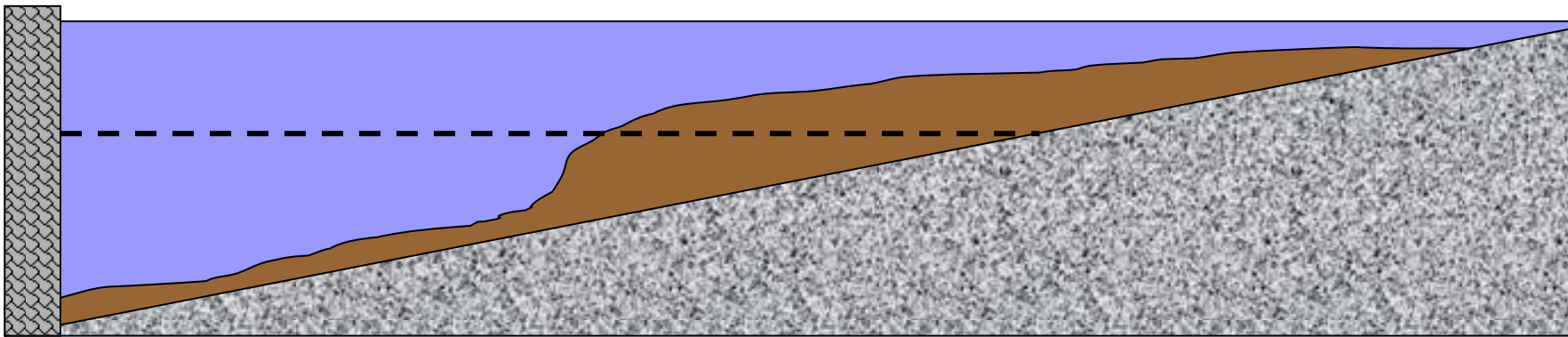
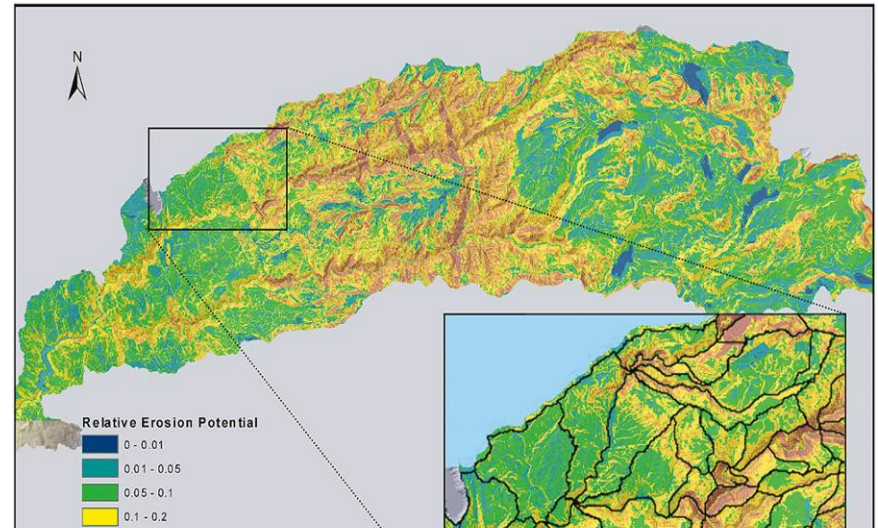


Photo by Dave Vogel



# Sediment Studies

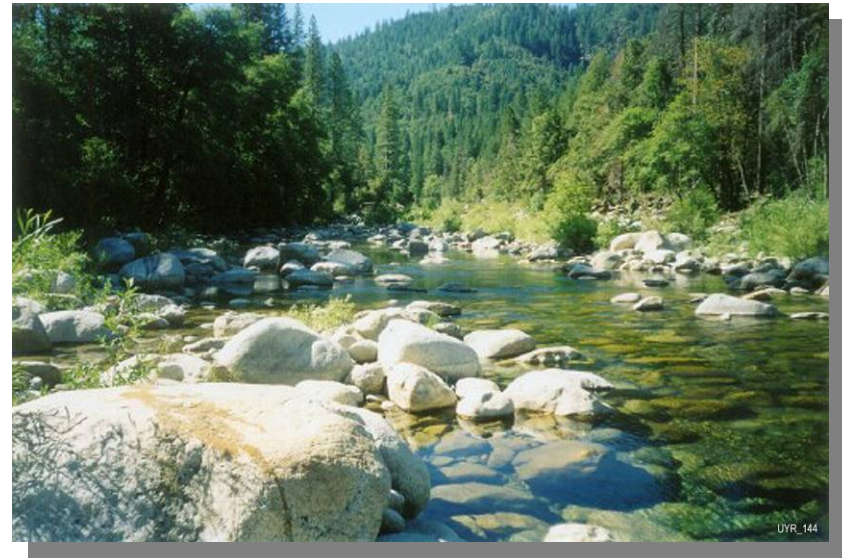
- ❖ *Watershed Sediment*
  - *characteristics*
  - *sources and yields*
  - *modeling (HSPF)*
- ❖ *Reservoir Sediments*





# Water Quality

- ❖ *Describe current water quality*
  - *Current surface water quality*
  - *Distribution of Hg compounds in the reservoir*
  - *Role of Englebright Lake in Hg storage and methylation*
  - *Hg levels in fish and invertebrate tissues*



# Water Supply and Hydropower

- ❖ *How would changes affect water supply/hydropower?*

- ❖ *Characterize current operations*

- ❖ *Next Steps:*

- *develop hydrologic model*
- *review model assumptions and inputs*
- *populate the model and ensure the model accurately simulates existing conditions*





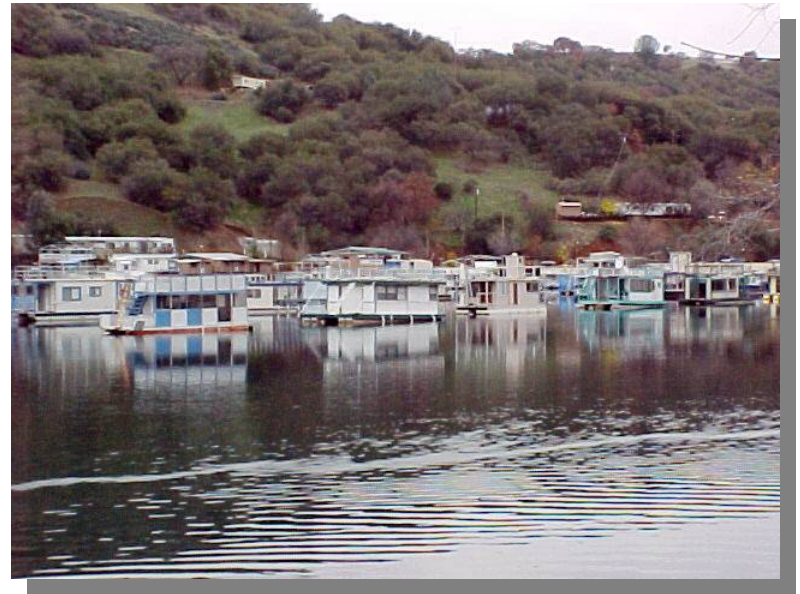
# Flood Risk

- ❖ Would fish passage affect flood risk?
- ❖ “no net decrease in level of flood protection”
- ❖ Flood modeling
  - HEC-6T
  - HEC-RAS

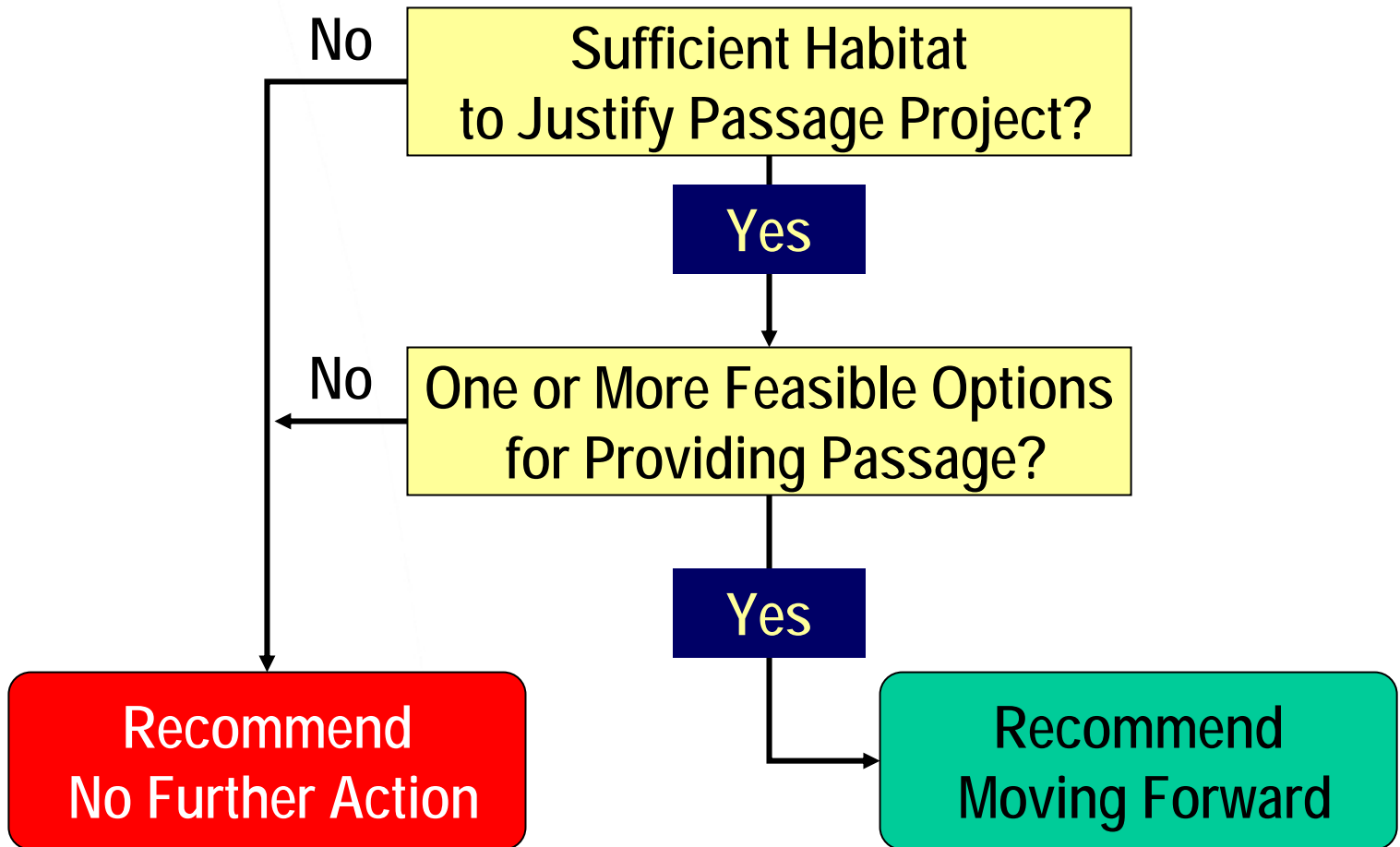


# Socio-Economics

- ❖ *What are the benefits and costs?*
- ❖ *Estimate changes in:*
  - *Regional Economy (jobs, income, goods & services)*
  - *Property Values*
  - *Agricultural Costs*
  - *Water Supply/Hydro*
  - *Recreation*
  - *Passive Use Values*
- ❖ *Next Steps:*
  - *Recreation / Passive Use survey?*
  - *Analysis of fish passage options when defined*



# Work Group Decision Framework





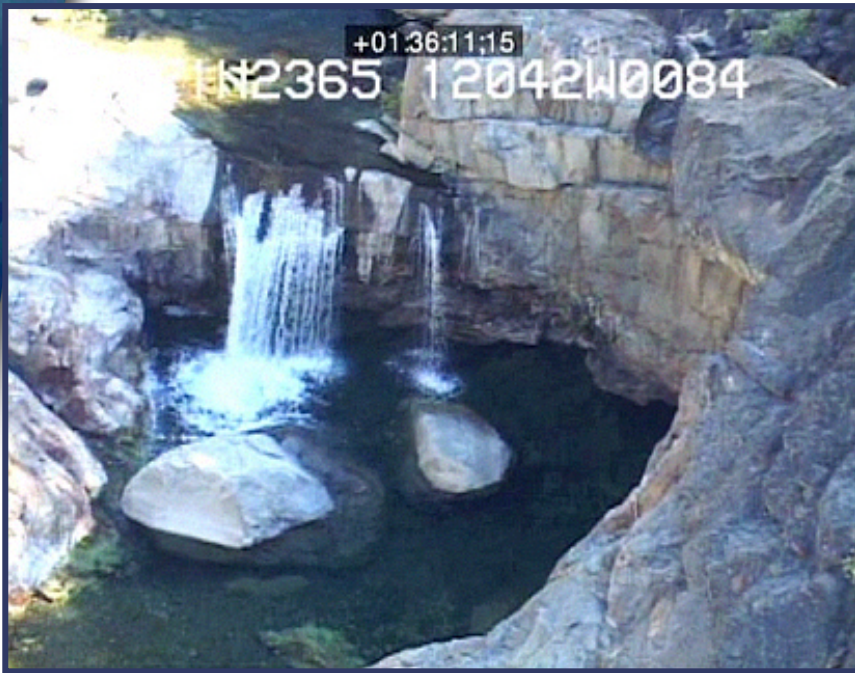
# Upper Yuba River Studies Program



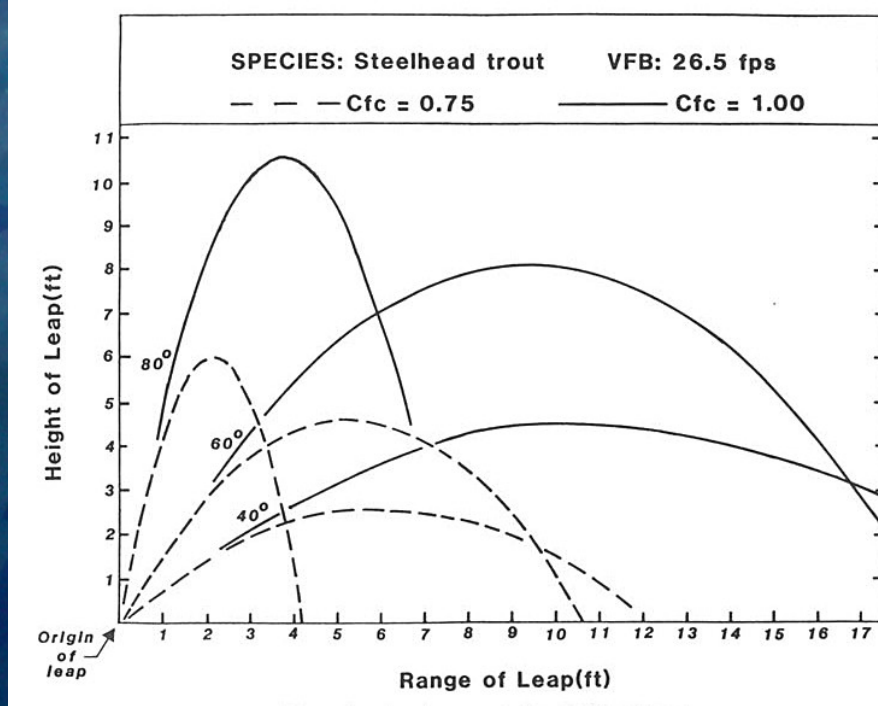
## Upstream Habitat



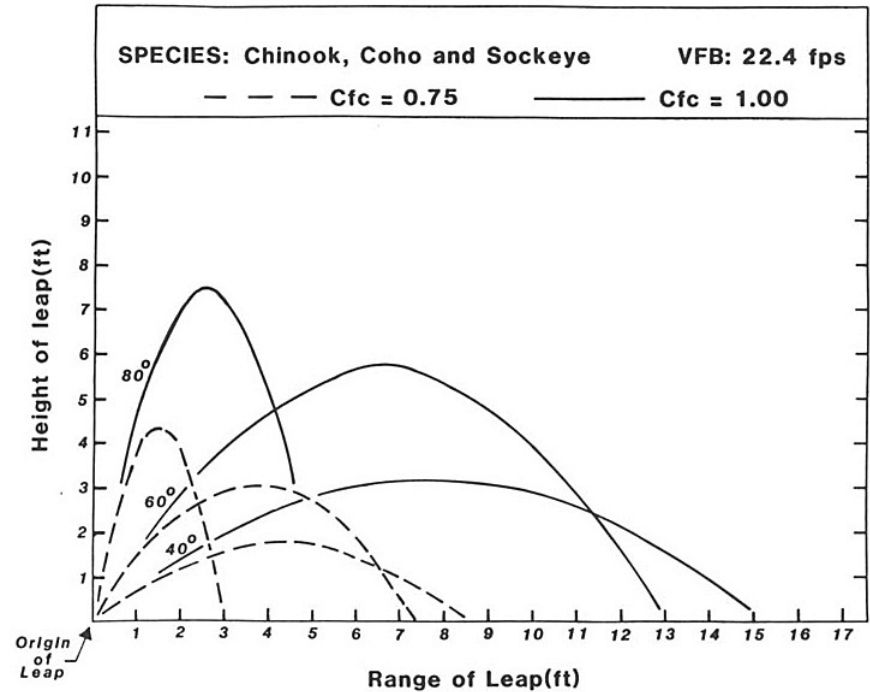
# Adult Fish Barriers and Holding Habitat



# Leaping Abilities

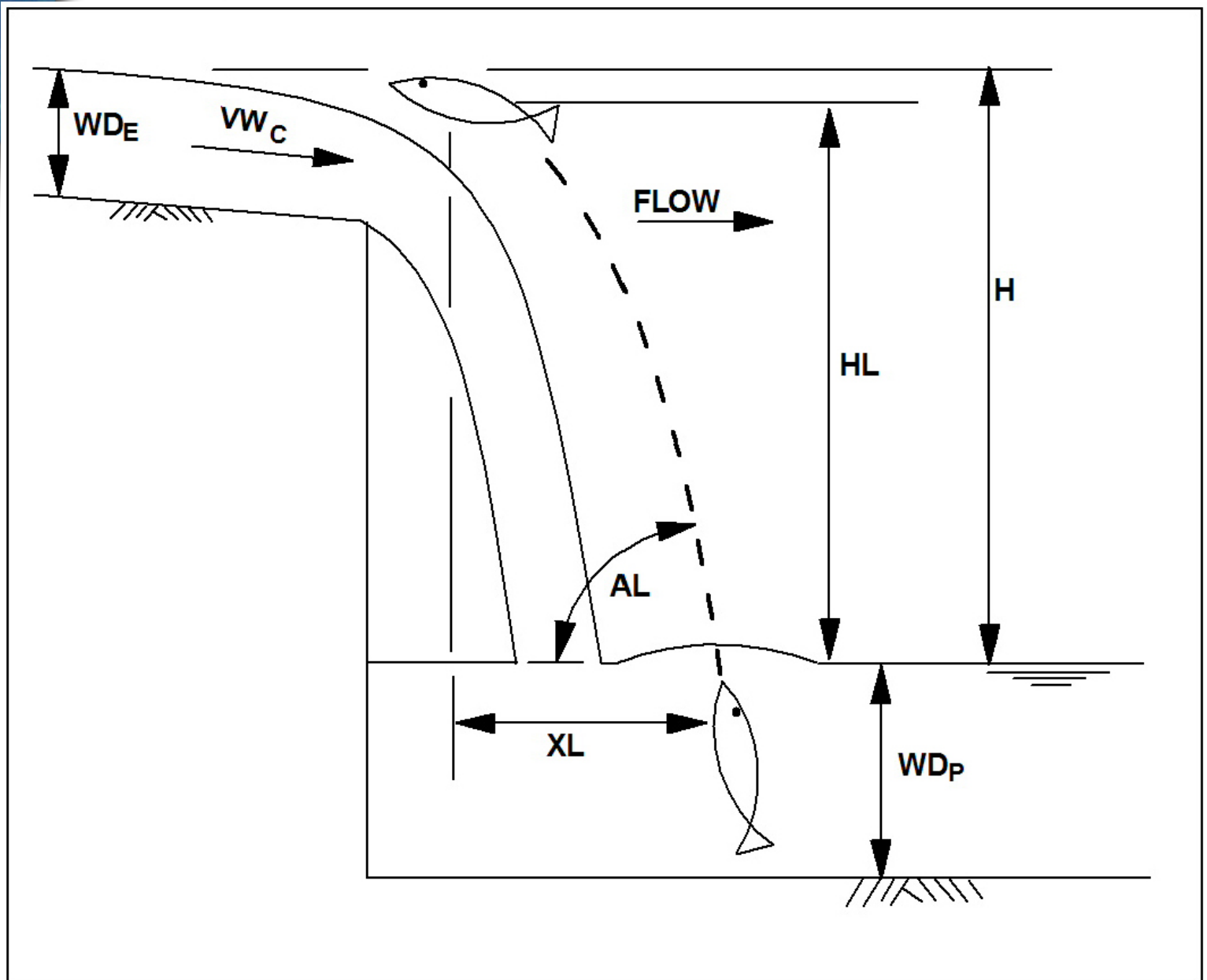


STEELHEAD



CHINOOK







# Low-Flow Aerial Digital Video





# High-Flow Aerial Digital Video





# Field Verified at Representative Sites





# Examining Plunge Pool Characteristics











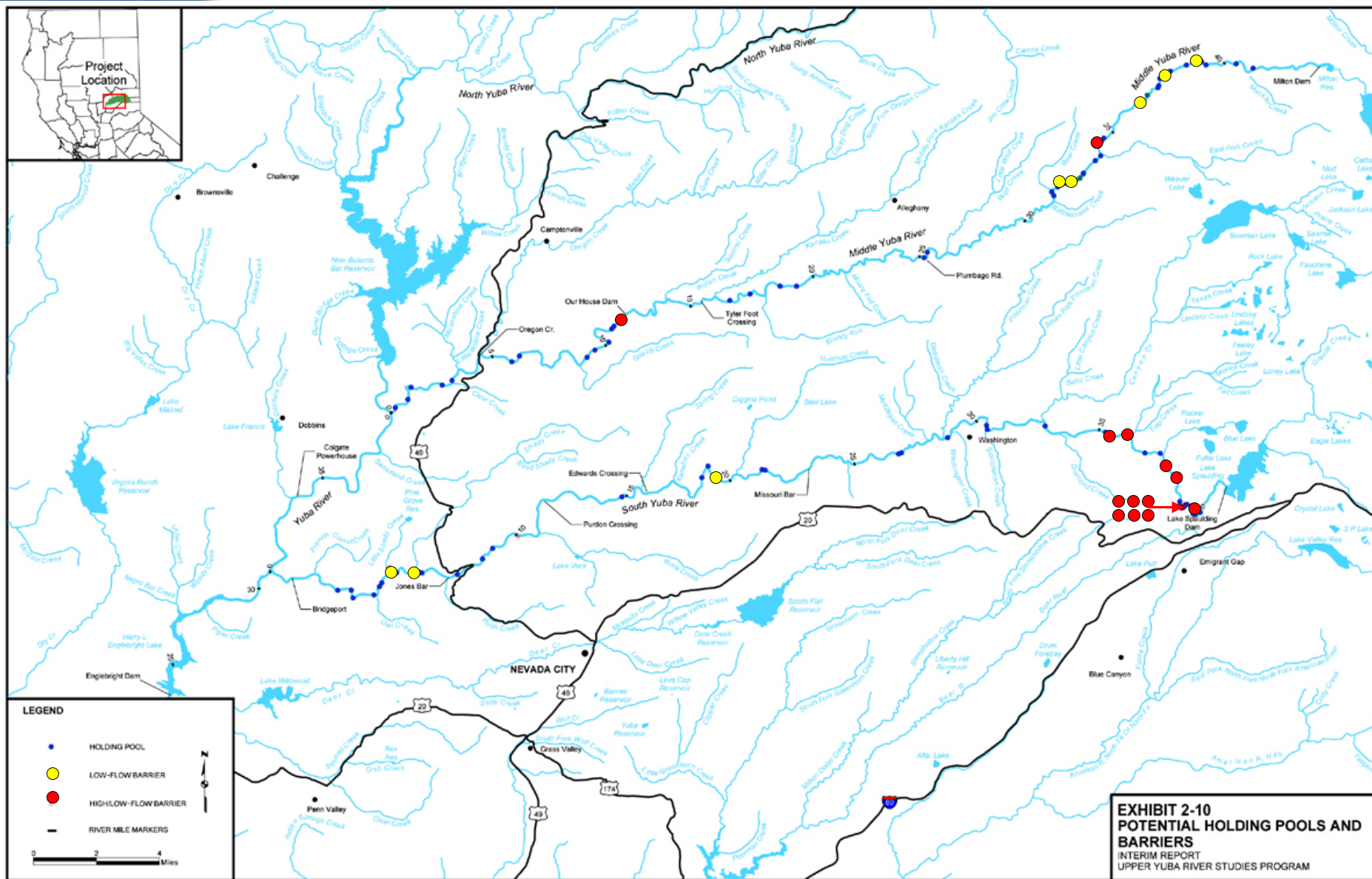






# Our House Dam







# Holding Habitat



Photo by Dave Vogel







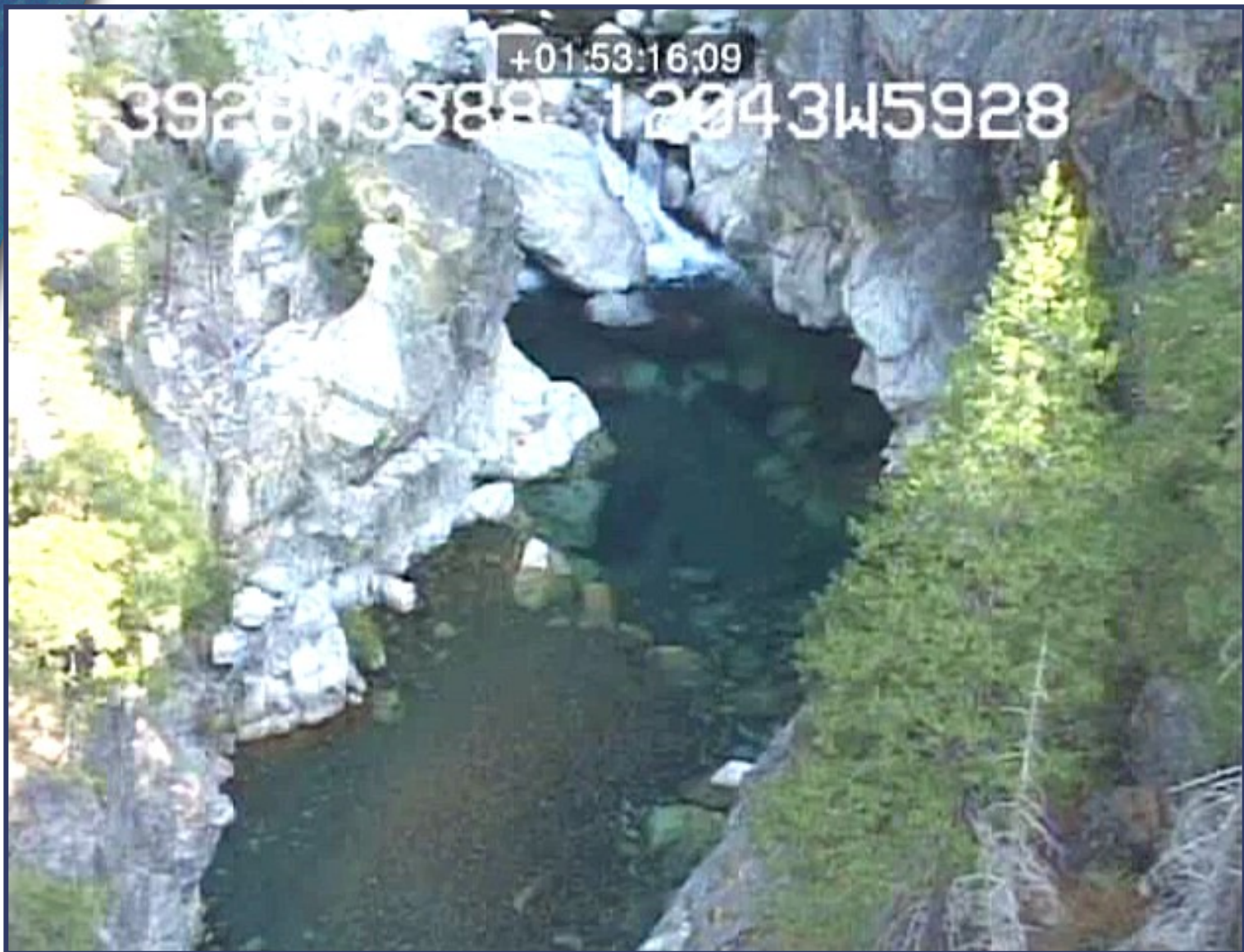






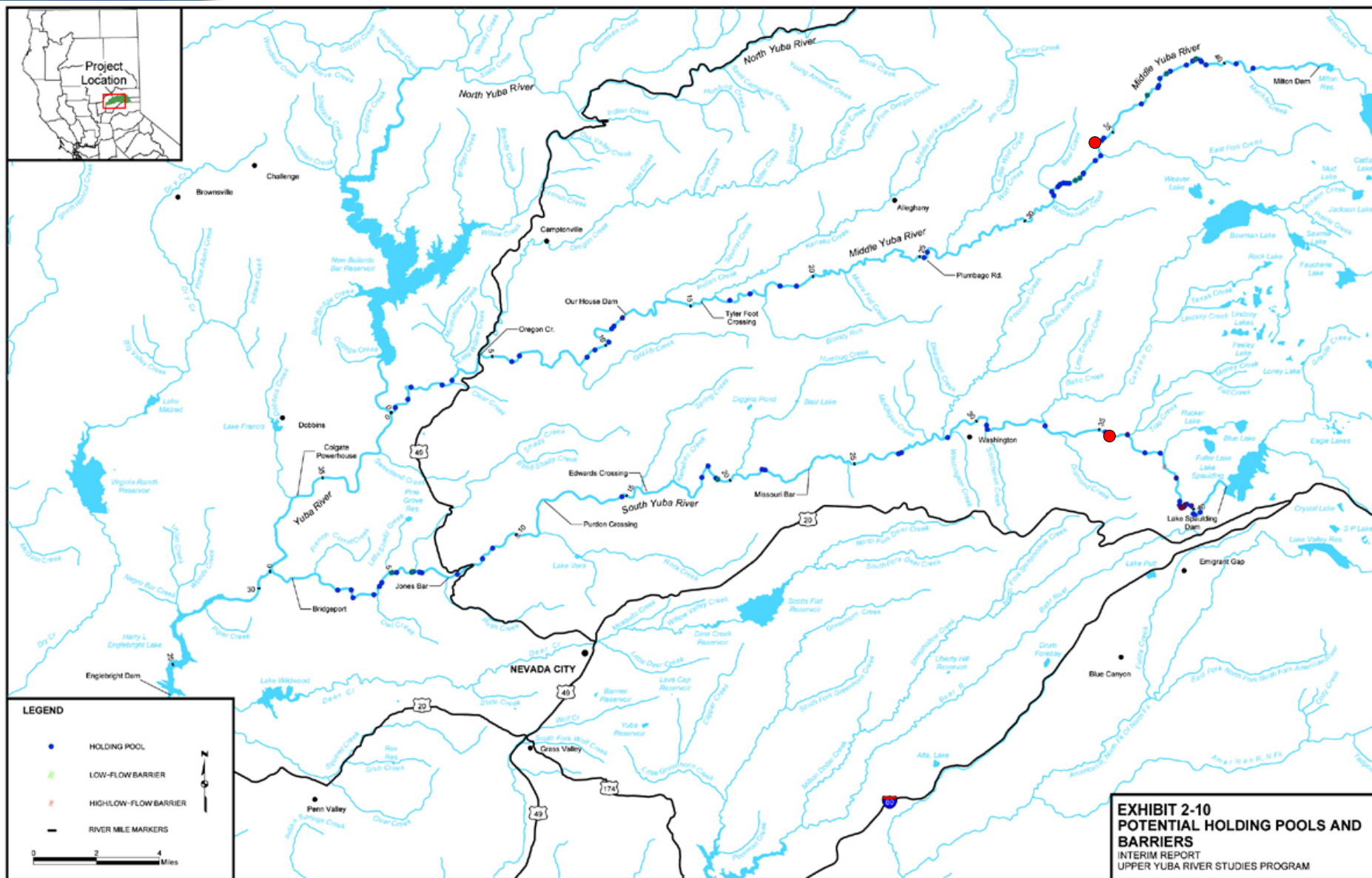






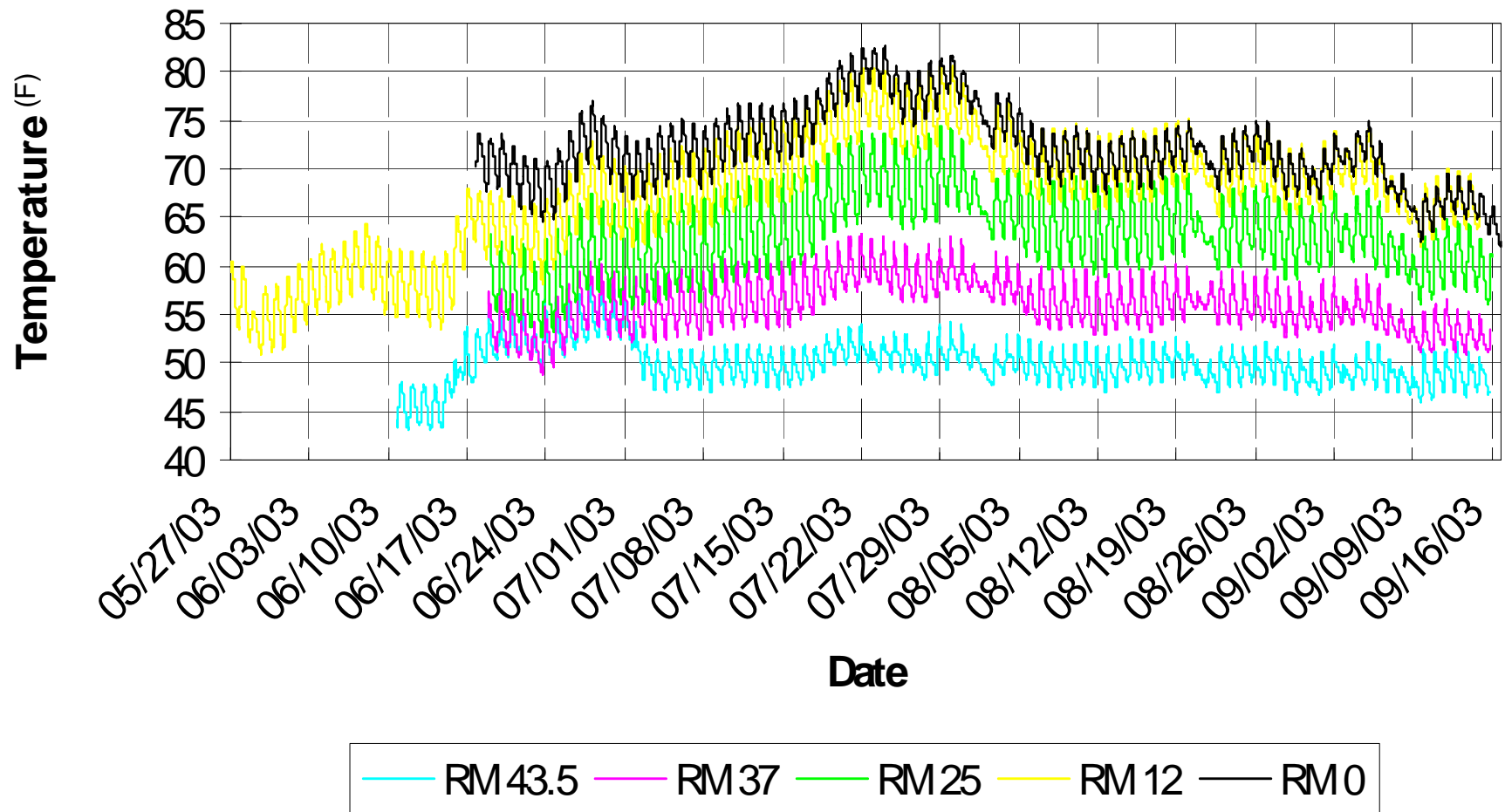




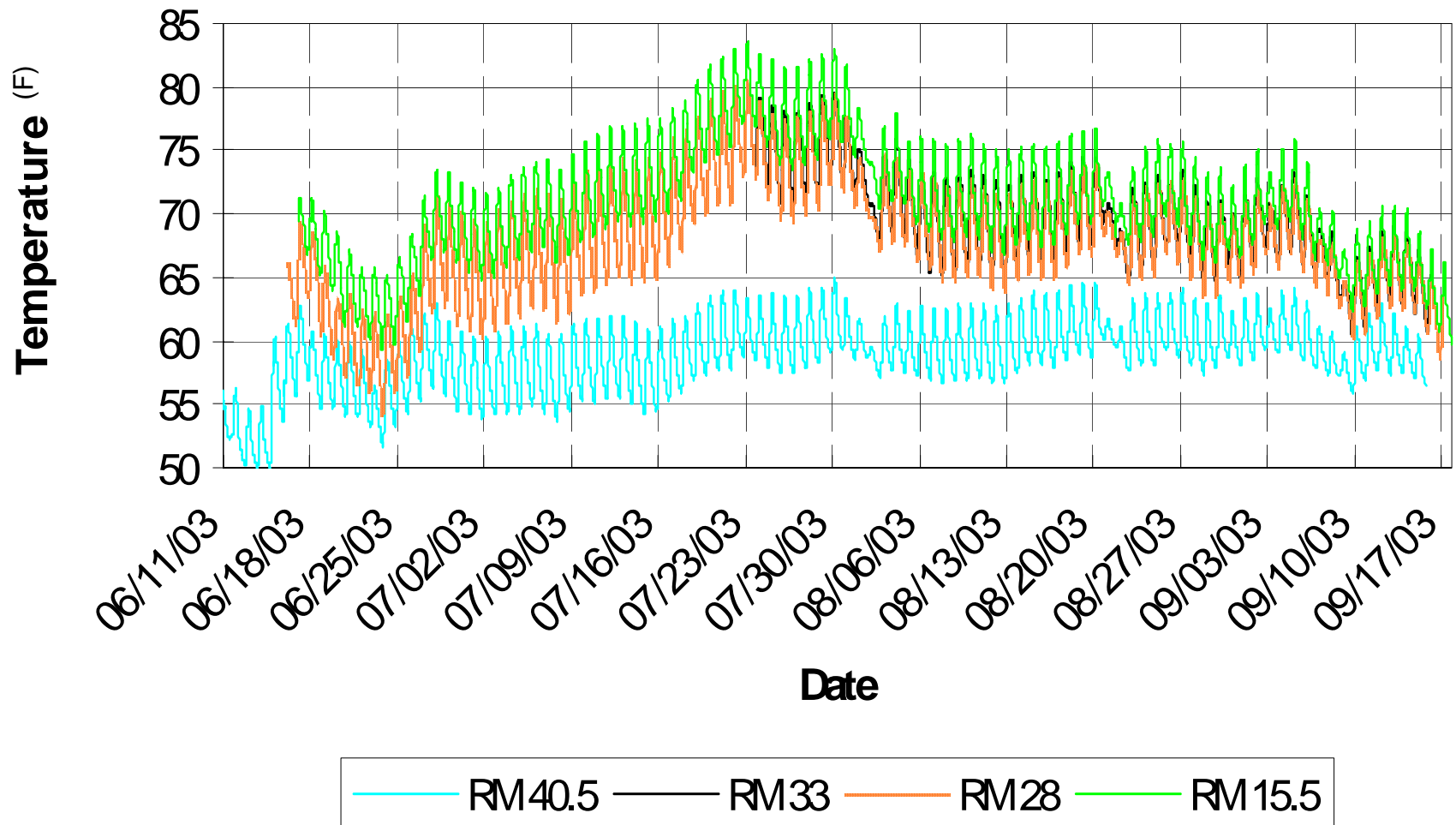




## Middle Yuba Water Temperatures

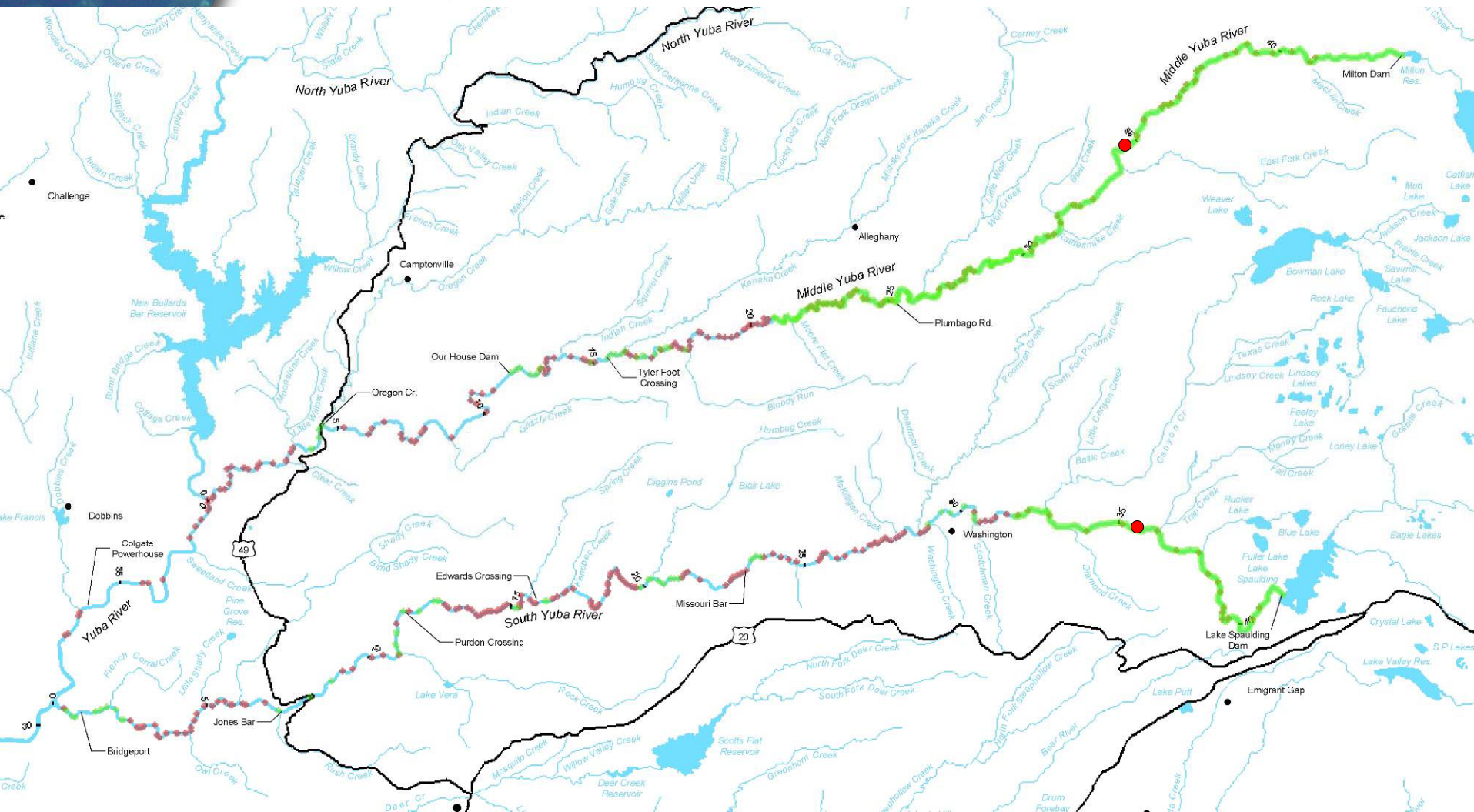


## South Yuba Water Temperatures





# Spring-Run Chinook Salmon Summer Holding



# Spawning Habitat





# Study Sites

- ❖ *Over 400 potential sites – video*
  - *Difficult to see small gravels*
  - *Blurry & dark images for 10% of sites & upper canyons*
  - *No video of tributaries*
- ❖ *Field survey of 101 sites*
  - *Middle and South Yuba rivers*
  - *Detailed measurements at 40 sites*
  - *Visual assessments at 61 sites*
  - *Oregon, Kanaka, Wolf creeks for Middle Yuba River*
  - *Canyon & Poorman creeks for South Yuba River*



# Data Collection

## ❖ *Wolman Pebble Counts*

- *Measure diameter of 100 rocks*
- *at 10% of potential sites*

## ❖ *Streambed permeability*

- *Index of intra-gravel flow and sand concentration*
- *Measure pumping rate*
- *Loosen gravel prior to measurement*
- *At 7% of potential sites*

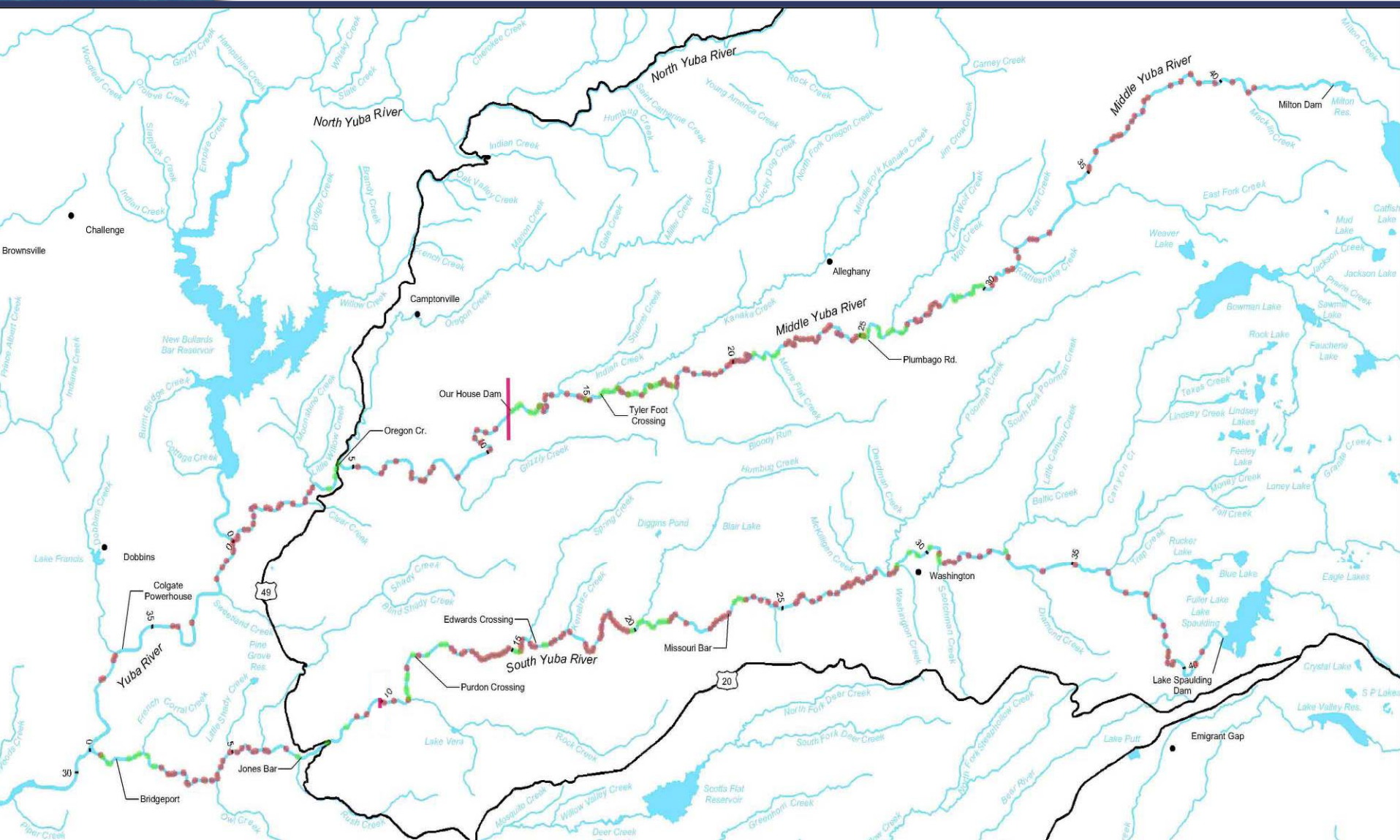




# Data Collection

- ❖ *Other measurements*
  - *Depth of holding habitat*
  - *Overhead cover*
  - *Area & depth of gravel*
  - *Water depth & velocity*







# Results

- ❖ *415 Sites Plus Many Small Pockets*
  - *Almost none in five large tributaries*
- ❖ *Chinook Refuge Habitat at 391 sites*
  - *High flows provide refuge for steelhead at all sites*
- ❖ *Small Gravel Beds*
  - *Mean 850 square-feet*



# Results

- ❖ *Median gravel size  
1.7 inches*
- ❖ *High Permeability*
  - *Mean 13,227 cm/hr  
South Yuba River*
  - *Mean 34,201 cm/hr  
Middle Yuba River*
  - *5,000 cm/hr in San  
Joaquin tributaries*





# Human Effects

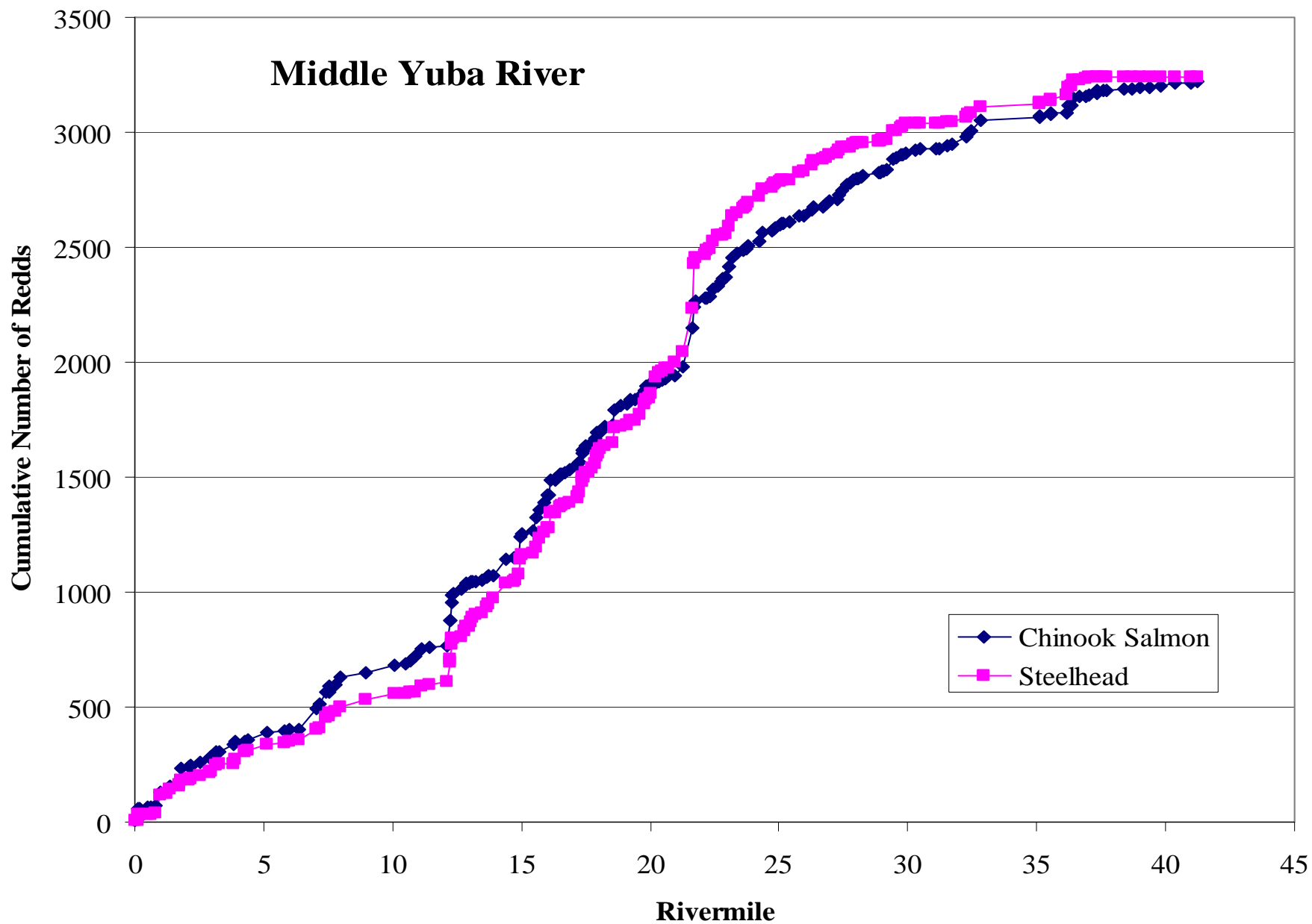


**Cobble Weir Construction**

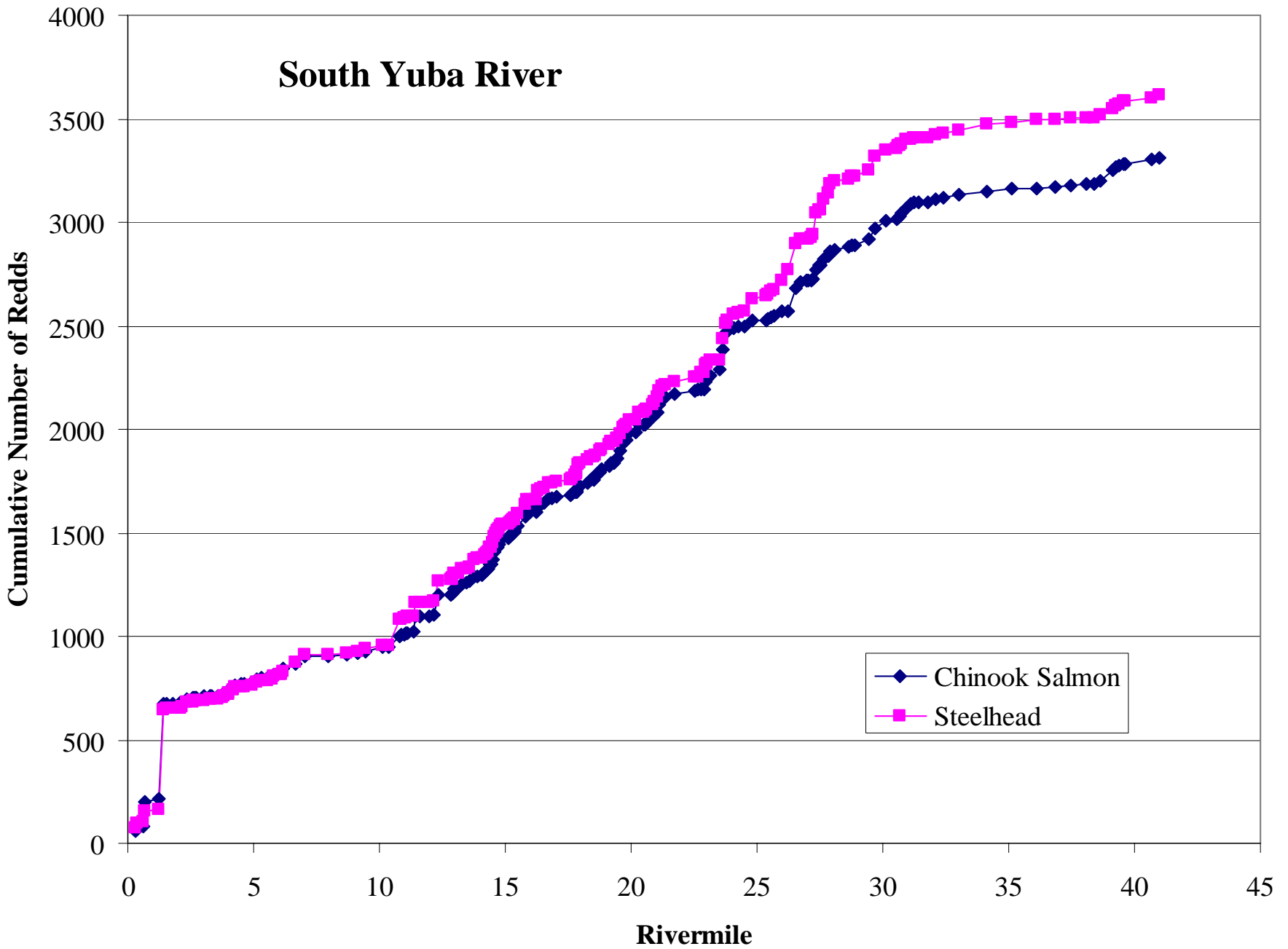
**Suction Dredging**



## Middle Yuba River







# Rearing Habitat





# Available Data

- ❖ *Topographic maps*
- ❖ *Aerial photos*
- ❖ *Digital videography*
- ❖ *Historical field investigations*
- ❖ *Ground truthing*





# Off-Channel Habitat



- ❖ *Backwaters, secondary channels*
- ❖ *Rearing areas for fry; velocity refuge during high flows*





# Riparian Vegetation and Shade

- ❖ *Potential for cover, food supply, shade*
- ❖ *Present or absent*
- ❖ *Continuity and width of riparian vegetation*
- ❖ *Amount of channel shaded from above*





# Substrate

- ❖ *Dominant substrate*
- ❖ *Potential for cover*
- ❖ *Potential for food*
- ❖ *Stranding potential*



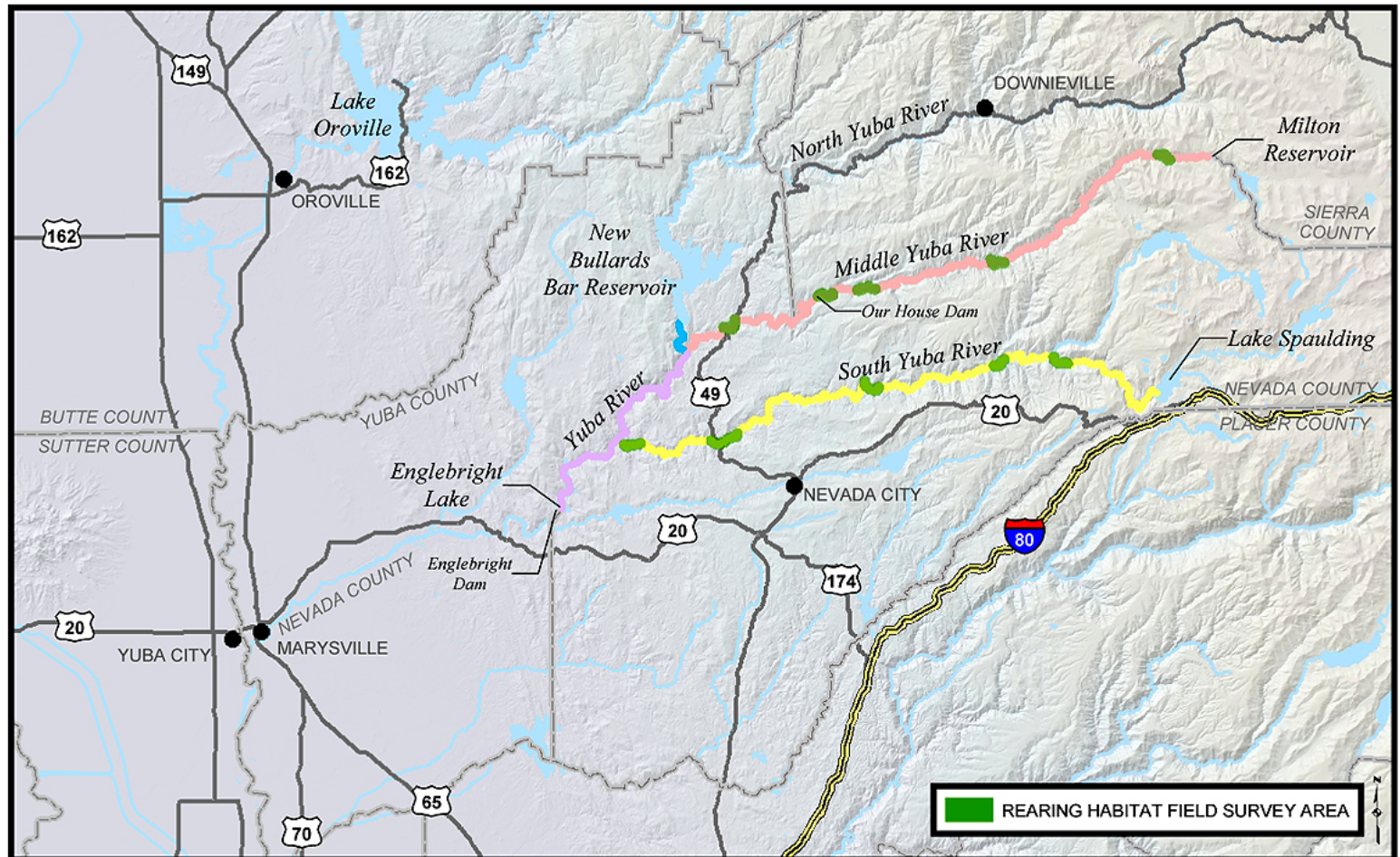


# Cover

- ❖ *Refuge from predators*
- ❖ *Refuge from high flows*
- ❖ *Instream/overhead cover*
  - *Riparian vegetation*
  - *Large woody debris (LWD)*
  - *Boulders*
  - *Hydraulic conditions: turbulence, bubble curtain*



# Ground Truthing: Survey Reaches



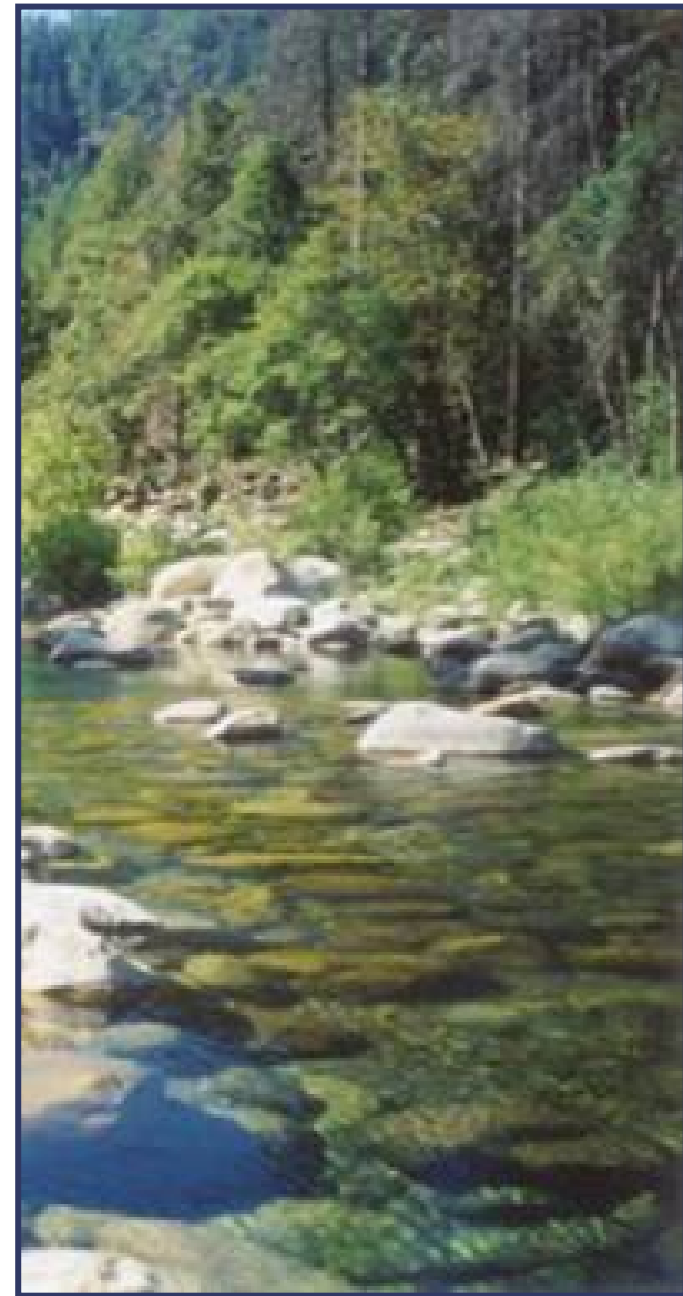
UYR\_112





# Ground Truthing: Key Findings

- ❖ *Similarity greatest for macrohabitat features (e.g., habitat type, riparian vegetation)*
- ❖ *Similarity lowest for microhabitat features (e.g., substrate, cover)*
- ❖ *Concluded that reliability is adequate*



# Habitat Study

## Preliminary Conclusions

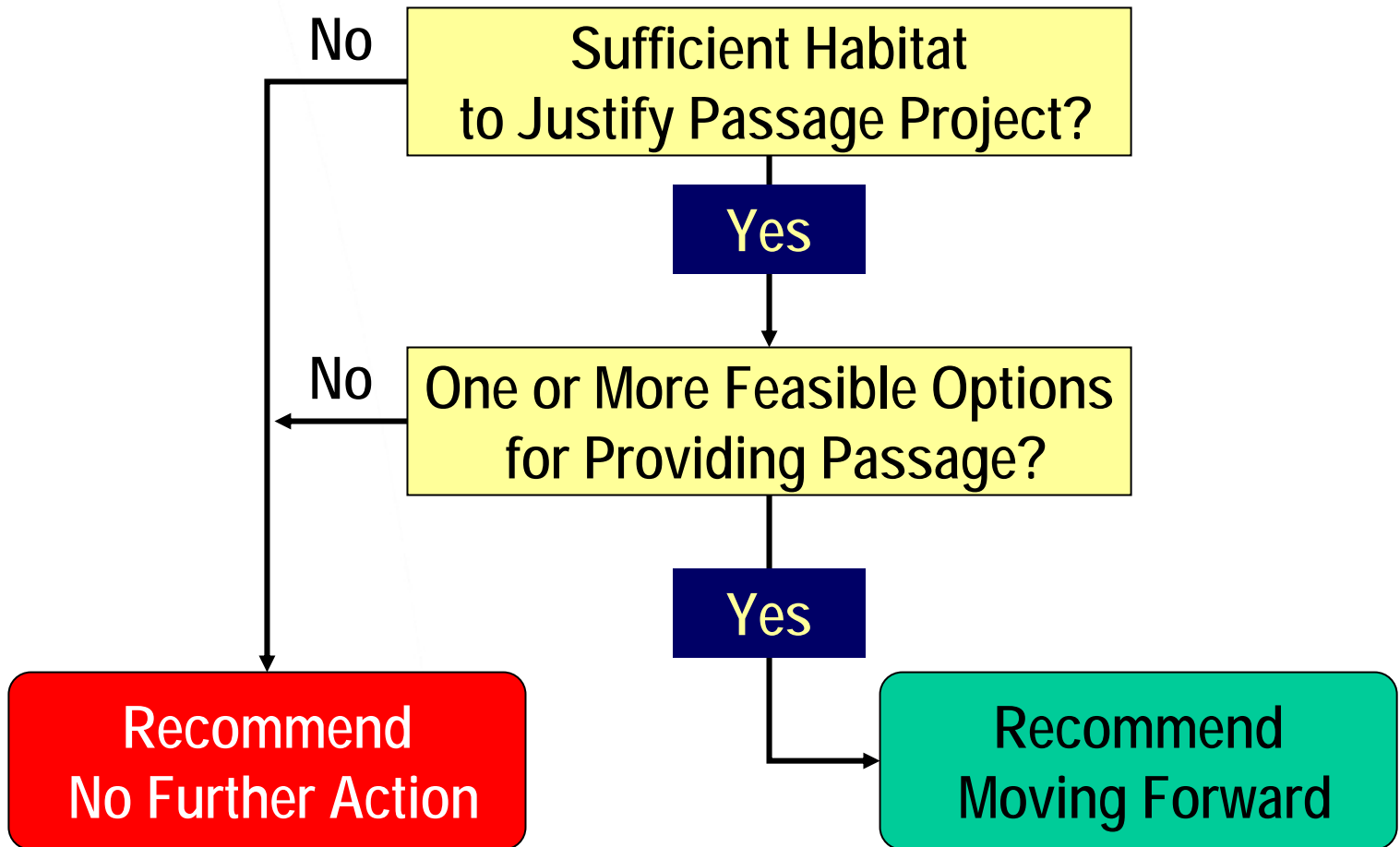
### *Under current conditions:*

- ❖ *Physical habitat characteristics are generally adequate to support salmonids in Middle and South Yuba rivers*
- ❖ *Upstream adult passage blocked on Middle Yuba at Our House Dam*
- ❖ *Surveyed tributaries do not appear to support spawning habitat for large salmonids*
- ❖ *Suitability of accessible habitat in the upper river likely limited by elevated water temperature under current conditions*





# Work Group Decision Framework



# Next Step: Biological Feasibility

Sufficient Habitat to Support  
Viable Populations under  
Current and Future  
Conditions?

Water Temperature Monitoring  
Data and Modeling

Trout Distribution Survey Data

Population Viability Assessment

Yes

No

Develop and Analyze Fish  
Passage Options

Recommend No Further Action  
Workgroup to provide additional  
guidance (if desired) to the  
Authority to close out existing  
studies and to recommend  
potential future activities  
in the watershed.

